Volume 25 Study G-I

STATE OF ALASKA

Bill Sheffield, Governor

Annual Performance Report for

GLENNALLEN/PRINCE WILLIAM SOUND ANGLER USE AND STOCK ASSESSMENT STUDIES

by

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RESEARCH PROJECT SEGMENT

State:	Alaska	Name:	Sport Fish Investigations of Alaska
Project No:	F-9-16		
Study No:	G-I	Study Title:	INVENTORY AND CATALOGING
Job No:	G-I-F	Job Title:	Glennallen/Prince William Sound Angler Use and Stock Assessment Studies

Cooperators: Fred T. Williams and Wilson D. Potterville

Period Covered: July 1, 1983 to June 30, 1984

ABSTRACT

During 1983 a creel census was conducted on the Gulkana River from June 7 to August 14. The estimated effort was 11,707 angler-days and 47,714 fishing hours. The estimated catch was 1,945 chinook salmon, Oncorhynchus tshawytscha (Walbaum), 1,299 sockeye salmon, Oncorhynchus nerka (Walbaum), 1,192 rainbow/steelhead trout, Salmo gairdneri Richardson, and 20,871 Arctic grayling, Thymallus arcticus (Pallas). These catch estimates represent numbers of fish both kept and released.

Fishing effort on the Gulkana River increased from 2,734 angler-days in 1975 to 11,707 angler-days (328 percent) in 1983. The estimated catch of chinook salmon increased from 697 in 1975 to 1,945 in 1983 (179 percent). From 1980 to 1983 the grayling catch increased from 5,716 to 20,871 (265 percent). The rainbow trout catch increased from 732 in 1980 to 1,192 in 1983 (63 percent). In 1983 anglers kept only 12.5 percent of the grayling caught, 79 percent of the chinook salmon, 67 percent of the sockeye salmon, and 41 percent of the rainbow trout.

Aerial chinook salmon escapement counts were generally lower than in 1982; however, the 1983 count of 1,181 in the Gulkana River was slightly higher than the 12-year average of 1,051.

Measurements and scales were taken from 412 sport-caught grayling in the Gulkana River. These fish ranged in fork length from 152-385 millimeters and averaged 296 millimeters. The weighted average length of 1,025 sport-caught grayling from 1968 through 1982 was 280 millimeters. The predominant size groups in the catch since 1978 are 230-279 millimeters

(Age III+) and 280-330 millimeters (Age IV+). The number of sport-caught grayling over 382 millimeters fork length has been declining since 1978.

In September 1982 twenty-five steelhead trout were captured in the Copper River and equipped with high frequency radio transmitters. These fish were tracked from aircraft equipped with radio receivers. The tracking was continued through 1983 until the transmitter batteries went dead. Overwintering and spawning areas were located in the Copper River, Gulkana River and Tazlina River. Hungry Hollow Creek, tributary to the Middle Fork of the Gulkana River, was established as the furthest north location of steelhead trout in Alaska.

Survival and growth of stocked fish in 11 managed lakes was checked using test nets and rod-and-reel sampling methods. Fish species caught include Arctic grayling, rainbow trout, burbot, Lota lota (Linnaeus), coho salmon, Oncorhynchus kisutch (Walbaum), and longnose sucker, Catastomus catostomus (Forster).

Four previously unsurveyed lakes were surveyed in 1983. Fish species captured include Arctic grayling, Longnose suckers and rainbow trout. Summit Lake, located in the Wrangell-St. Elias National Park, was surveyed and found to have a resident population of large rainbow trout. Twenty-eight rainbow trout taken with test nets and rod and reel ranged in fork length from 140-740 millimeters and averaged 560 millimeters. Analysis of scale samples revealed that 9 percent were Age II, 36 percent Age V and 55 percent Age VI.

Two lake systems, Tolsona-Moose and Jack, were trapped to determine their potential as grayling egg take sites. A total of 1,274 grayling were trapped at Our Creek (Tolsona-Moose) and 1,003,840 eggs were taken. Two egg takes were made and the fecundity was 4,335 and 3,640 eggs per female, respectively. The inlet to Jack Lake was also trapped and 555 grayling were captured. A total of 751,225 eggs were taken from 214 female fish for a fecundity of 3,510.

Population estimates of Swanson strain rainbow trout stocked in 1982 were made on Tex Smith and Little Junction Lake. Survival of these rainbow trout was estimated at 35 percent in Tex Smith Lake and 12 percent in Little Junction Lake. Tex Smith Lake had a resident population of rainbow trout when it was stocked in 1982. Little Junction Lake had a resident population of Arctic grayling and dissolved oxygen concentrations dropped to 1.0 part per million during the winter of 1982-83.

Escapement surveys of Valdez Bay salmon spawning streams were conducted in 1983. Five of the eight pink salmon, Oncorhynchus gorbuscha (Walbaum), index streams surveyed had a significant decrease in escapement levels from 1981, the parent year. Flooding conditions, new dock construction, use of one of the streams for hatchery donor stock and commercial seining operations near the streams may have all contributed to the decrease.

Sport-caught round whitefish, Prosopium cylindraceum (Pallas), and humpback whitefish, Coregonus pidschiam (Gmelin), taken from the Slana River, were measured to determine trends in the size of harvested fish. The weighted average fork length of 963 whitefish, sport caught from 1964 through 1982, was 361 millimeters. The average of 112 whitefish caught in 1983 was 368 millimeters.

KEY WORDS

Gulkana River, chinook salmon, Arctic grayling, rainbow/steelhead trout, telemetry, Copper River, Valdez, whitefish, habitat protection, coho salmon, creel census, burbot.

BACKGROUND

Recreational fishing opportunities in the Copper River drainage, upper Susitna River drainage and northeastern Prince William Sound area are provided by anadromous, indigenous and stocked fish species.

Lake dwelling species caught by recreational anglers in the Copper River Basin are the indigenous species (burbot, lake trout, Arctic grayling and whitefish) and the introduced species (coho salmon and rainbow trout). The stream dwelling species most often taken by sport anglers are: Arctic grayling, Dolly Varden, rainbow/steelhead trout, whitefish, chinook and sockeye salmon.

The majority of angling pressure is on waters adjacent to the highway system. The study area, which includes the Copper River Basin, upper Susitna River Basin, Cordova, Eastern Prince William Sound and Valdez, has over 650 miles of the Alaska Highway System within its borders. A map of the study area is presented in Figure 1.

Fishing within the Cordova (Prince William Sound) area is primarily commercially oriented. Access to this area is only by boat or aircraft. Sport fishing effort in salt water is primarily for coho salmon, chinook salmon, pink salmon and halibut. Freshwater angling is directed toward coho salmon, cutthroat trout, sockeye salmon, Dolly Varden and stocked grayling. A significant increase in sport fishing effort is not anticipated until access to, and within, the area improves. The limited Cordova area road system (approximately 60 miles in length) affords access to several lakes and streams with grayling, cutthroat trout and coho salmon populations.

Most of the recreational angling opportunities in the Valdez area are provided by saltwater fisheries directed toward anadromous species, including pink salmon, chum salmon, coho salmon and bottom fish. All freshwater drainages into Valdez Arm are closed to salmon fishing but Dolly Varden are taken in fair numbers.

The present population of Valdez is estimated to be 3,500 people. It is expected Valdez will continue to grow and become more industrialized in

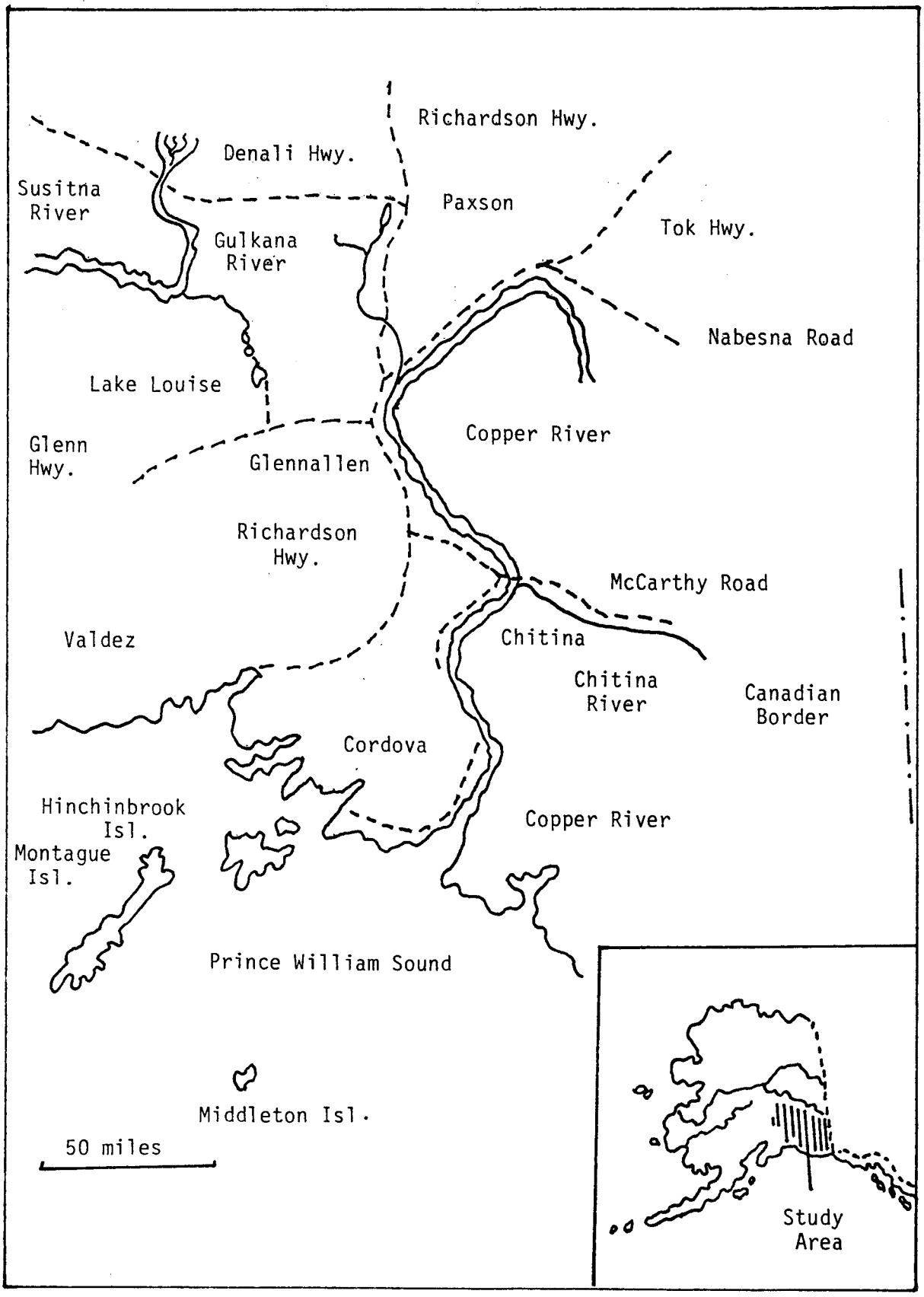

Figure 1. Map of Study Area.

the future. The expected growth may have a detrimental effect on the fisheries. Suitable land for homes and businesses is limited in the Valdez area, and already there are trailer courts, housing projects and dock facilities adjacent to or bisected by salmon spawning streams. Spawning and rearing areas for fish may be reduced, polluted and - possibly, the ground water supplies may be adversely affected. Increases in human population often result in additional harassment of spawning salmon, and increased monitoring of the fish stocks may be necessary. Presently the fish stocks are in good condition and there appears to be no need for more restrictive angling regulations at this time. According to the Statewide Harvest Study (Mills 1978-1983), Valdez area fishing effort in 1982 was 22% less than the 5-year average from 1977 through 1981. The catch of pink salmon and coho salmon was down 41 and 19%, respectively.

The Solomon Gulch Private Non-Profit Hatchery in Valdez became operational in late 1982 for the production of pink and chum salmon fry and coho salmon smolt. Presently the Solomon Gulch Hatchery is incubating over 140,000 coho salmon eggs, 9.7 million pink salmon eggs and an estimated 1.8 million chum salmon eggs.

The land disposal program conducted by the Alaska Department of Natural Resources has made large tracts of land in the study area available for private ownership. Much of this land borders lakes and streams which support, or have the potential to support fish. Retention of lands for public recreation and access has become a very important facet of fisheries investigations in the area.

Activities reported in the following text are directed to the research of subsequent management needs of the various fish species and toward the attainment of desirable levels of angler utilization. In 1983 the Biometrics Section of the Sport Fish Division elected to conduct an economic study of fishermen utilizing the Gulkana River. Since sampling personnel would be on the river collecting data for the economic study, it was decided that a creel census program could be conducted at the same time. This creel census was not included in the original objectives for the 1982-83 activities. The species of fish discussed in this report are listed in Table 1.

RECOMMENDATIONS

1. The study of anadromous fish stocks in the upper Copper River drainage and Prince William Sound should be continued to determine run timing and magnitude with emphasis on the Gulkana River, Mendeltna Creek and streams flowing into the eastern portions of Valdez Bay.

2. Monitoring of mining activities, road and bridge construction, pipeline maintenance, oil and gas development and other land uses should be continued to afford maximum protection to the fishery resource and habitat.

Table 1. List of Common Names, Scientific Names and Abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Pink salmon	Oncorhynchus gorbuscha (Walbaum)	PS
Chinook salmon	Oncorhynchus tshawytscha (Walbaum)	KS
Chum salmon	Oncorhynchus keta (Walbaum)	CS
Coho salmon	Oncorhynchus kisutch (Walbaum)	SS
Sockeye salmon	Oncorhynchus nerka Walbaum)	RS
Lake trout	Salvelinus namaycush (Walbaum)	LT
Rainbow trout	Salmo gairdneri Richardson	RT
Burbot	Lota lota (Linnaeus)	BB
Longnose sucker	Catostomus catostomus (Forster)	LNS
Arctic grayling	Thymallus arcticus (Pallas)	GR
Round whitefish	Prosopium cylindraceum (Pallas)	WF
Humpback whitefish	Coregonus pidschiam (Gmelin)	WF
Dolly Varden	Salvelinus malma (Walbaum)	DV
Cutthroat trout	Salmo clarki Richardson	CT
Halibut	Hippoglossus stenolepis (Schmidt)	H

3. Continued evaluation should be made of experimental fish stocking to determine the species and strains of fish suited for individual lakes. This can be done by comparing the survival and growth of rainbow trout, coho salmon and grayling planted under different environmental conditions. Lakes to be evaluated include Katherine, Mary Lou, Arizona, Moose, Rock and Strelna.

4. Cataloging and inventory surveys should be continued on a limited basis to increase our knowledge of the fisheries resources in the area, provide more fishing opportunities for the angler and use as a guide in recommending lands to be reserved for public recreation. Twin Lakes (Nelchina River drainage), Butte Lake and the unnamed lakes near Lake Louise have been selected for cataloging and inventory surveys.

5. Monitoring of grayling in the Gulkana River should be continued to determine age-length composition of sport-caught fish and any deterioration of the fishery.

6. Fisheries investigations in the Valdez area should continue as to determine the feasibility of proposed rehabilitation and/or enhancement programs of salmon stocks. Cooperative work with the Valdez Fisheries Development Association (VFDA) should be continued. The effects of the Solomon Gulch PNP Hatchery on the sport fisheries and donor streams should be monitored.

7. A creel census of coho salmon fishermen on Eyak River should be conducted. This is the major freshwater sport fishery in that area and no creel census has ever been conducted. Escapement counts and commercial fishery catches should be correlated with creel census data.

8. Limnological and biological studies on selected lakes in the area should be continued to complement the studies of stocked fish survival and growth, to complete previously initiated surveys and to determine the potential for successful establishment of additional sport fisheries.

9. The cooperative study of steelhead trout in the Copper River/-Gulkana River drainage should be continued to determine spawning and rearing areas, relative abundance, stock identification and migratory timing.

OBJECTIVES

1. To determine the abundance of coho salmon, chinook salmon and steelhead/rainbow trout in three lakes and three rivers from June through September and evaluate their suitability for enhancement.

2. To determine and evaluate stocking techniques for 21 stocked lakes from June through September and formulate recommendations for the management of these waters.

3. To determine and record environmental characteristics of five lakes during the fall and evaluate their management potential.

4. To investigate and evaluate Moose, Jack, Gillespie and Butte Lakes in May as potential donor sites for Arctic grayling egg takes.

5. To determine the effects of proposed construction and disposal programs and other land use programs on fisheries and aquatic environments. To assist in determining the current status of public access and access needs to the recreational fishing waters.

TECHNIQUES USED

Standard techniques described by Williams (1971) and outlined in the Alaska Department of Fish and Game Lake and Stream Survey Manual were used in lake and stream surveys and for collecting fish samples. Each test netting was conducted for a minimum of 16 hours, including an overnight period. In addition fyke nets, minnow traps, weirs and rod and reel were used for fish collection. All measurements of fish lengths were from snout to fork-of-tail.

Techniques described by Williams and Potterville (1983) were used during the 1983-84 steelhead trout study. Twenty-five steelhead trout were surgically implanted with three different sizes of high frequency transmitters. Thirteen of the Telonics transmitters were 2.3 inches long and had a diameter of 0.7 inches and ten of the Telonics transmitters were 3.75 inches long with a diameter of 0.7 inches. Two Advanced Telemetry Systems transmitters used had a length of 3.4 inches and diameter of 0.7 inches. The 13 smaller Telonics transmitters had a battery life of 9 months and the 10 larger ones had 18-month batteries. The Advanced Telemetry Systems transmitters had a battery life of 12 months. A Telonics scanning receiver was used in aerial tracking of the radio-implanted fish.

Winter dissolved oxygen concentrations were determined using a standard Hach field kit. Water temperatures were taken with a Heath Kit Thermo Spotter.

The Gulkana River creel census design was previously discussed by Williams and Potterville (1980).

Chapman's Modification of the Schnabel multiple census estimate of population size (Ricker, 1975) and ventral fin clips were used to formulate population estimates.

Salmon escapement enumerations were made from aircraft and on foot.

FINDINGS

Gulkana River Creel Census

In 1983 a creel census was conducted on the Gulkana River from June 7 to August 14. Previous creel censuses were conducted annually from 1975 through 1980. Estimates of the 1983 effort and catch are shown in Table 2.

In 1983, 64% of the chinook salmon catch occurred in the middle section of the river. This is the area from the Richardson Highway bridge upstream approximately 25 miles. The highest chinook salmon catch rate, 0.254 per angler day, also occurred in this area. The highest catch rate for sockeye salmon, 0.582 per angler day, was in the lower section. The lower section is that portion of the river from the Richardson Highway bridge downstream to the mouth which is a fly-fishing-only area (Figure 2).

The upper section of the river, from just below Sourdough Creek upstream to Paxson Lake, had the highest grayling catch. The total estimated grayling catch for this section was 20,552 and the catch rate was 3.44 per angler day. This is not surprising since estimated float angler days increased by 956 or 68% from 1980 to 1983 (Table 3). This increase in angler use by floaters is responsible for the increase in the grayling catch in this section. The estimated grayling catch by floaters increased 13,124 or 272% from 1980 to 1983. The upper section has the largest grayling population and is also the section of river preferred by floaters because of the variation in water conditions and relative remoteness.

Although the catch for all sections of the river totalled 20,871 grayling, only 2,612 (12.5%) were retained by anglers (Table 4). Anglers also kept 79% of the chinook salmon, 67% of the sockeye salmon and 41% of the rainbow/steelhead trout caught in all sections of the river. Floaters on the upper section of the Gulkana River kept only 7% of the grayling caught. This is the lowest incidence of fish retained by anglers on the entire river. Retention of fish on this section of river is low because it is difficult to preserve these fish for the duration of the average 3-day trip, and grayling are abundant which encourages release.

Table 5 compares fishing effort and catch from 7 years (1975-80, 1983) of creel census on the Gulkana River. From 1975 to 1983 the fishing effort has increased from 2,734 angler days to 11,707 angler days, or 328%. During this period the catch of chinook salmon has increased by 1,248 or 179%.

Since 1980 the estimated fishing effort on the Gulkana River has increased over 50% to 11,707 angler days in 1983. During this same period the catch of chinook salmon, sockeye salmon, rainbow trout and grayling increased 47%, 92%, 63% and 265%, respectively. Normally the catch does not increase at the same degree as the fishing effort.

Table 2. Gulkana River Creel Census Summary by River Section, June 7 - August 14, 1983.

	Lower Section	Middle Section	Upper Section	Total
Angler days	810	4,919	5,978	11,707
Angler hours	3,680	18,130	25,904	47,714
Hours per angler day	4.55	3.69	4.33	4.08*
Fish caught:				
Chinook salmon	174	1,251	520	1,945
Sockeye salmon	471	197	631	1,299
Rainbow trout	10	23	1,159	1,192
Grayling	15	304	20,552	20,871
Catch per angler day				
Chinook salmon	0.215	0.254	0.087	0.166*
Sockeye salmon	0.582	0.040	0.106	0.111*
Rainbow trout	0.013	0.005	0.194	0.102*
Grayling	0.019	0.062	3.438	1.783*
Number of fish kept:				
Chinook salmon	138	905	494	1,537
Sockeye salmon	138	197	533	868
Rainbow trout	10	23	460	493
Grayling	10	135	2,467	2,612

* Average effort and catch for all sections combined.

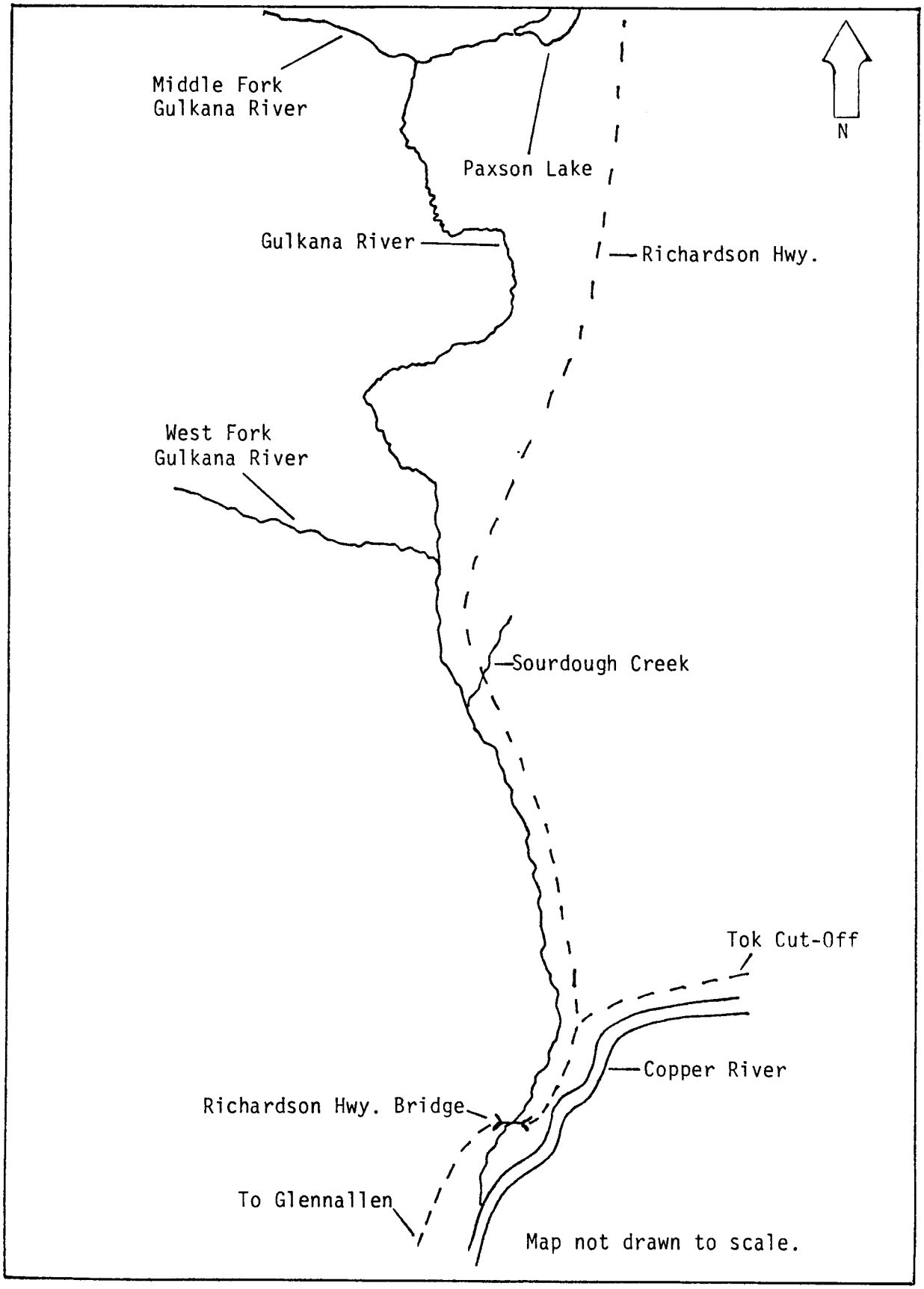

Figure 2 . Gulkana River Creel Census.

Table 3. Gulkana River Catch and Effort Creel Census Estimates for the Upper River Section by Shore, Float, and Power Boat Anglers, 1979, 1980 and 1983.*

	1979	1980	1983
Float Anglers			
Angler days	768	1,396	2,352
Chinook salmon	8	200	98
Sockeye salmon	0	70	94
Rainbow trout	70	628	739
Grayling	1,618	4,828	17,952
Power Boat Anglers			
Angler days	1,184	2,222	2,744
Chinook salmon	384	568	383
Sockeye salmon	32	578	379
Rainbow trout	30	98	418
Grayling	200	862	2,058
Bank Anglers			
Angler days	412	166	882
Chinook salmon	12	2	38
Sockeye salmon	0	0	158
Rainbow trout	2	20	4
Grayling	70	0	541

* Number of fish actually caught but not all were kept.

Table 4. Percentage of Fish Kept by Angler Type and Stream Section, Gulkana River, 1983.

Section and Angler Type	Species			
	Chinook Salmon	Sockeye Salmon	Rainbow Trout	Grayling
Lower				
Bank	79	29	100	67
Power boat	0	0	0	0
Floater boat*	...	...	...	...
Middle				
Bank	87	100	100	50
Power boat	39	100	0	0
Floater boat	63	100	100	46
Upper				
Bank	100	100	100	19
Power boat	98	75	53	53
Floater boat	83	95	32	7
Weighted average all sections	79	67	41	12.5

* No floaters were observed or interviewed in the lower section.

Table 5. Gulkana River Creel Census Summaries, 1975-1980 and 1983.

	1975	1976	1977	1978	1979	1980	1983
Angler Days	2,734	2,721	3,906	5,065	7,778	7,797	11,707
Angler Hours	13,171	12,344	17,735	27,406	...	...	47,714
Hours per Angler Day	4.82	4.54	4.54	5.41	...	...	4.08
Angler Catch							
Chinook salmon	697	296	332	429	1,960	1,320	1,945
Sockeye salmon	47	707	998	401	138	676	1,299
Rainbow trout	...	70	104	281	142	732	1,192
Grayling	...	690	1,330	...	2,144	5,716	20,871
Catch per Angler Day							
Chinook salmon	0.255	0.109	0.085	0.085	0.252	0.169	0.166
Sockeye salmon	0.017	0.260	0.256	0.079	0.018	0.087	0.111
Total salmon	0.272	0.369	0.341	0.164	0.270	0.256	0.277
Rainbow trout	...	...	...	...	...	...	0.025
Grayling							1.780
Catch per Hour							
Chinook	0.053	0.024	0.019	0.016	...	...	0.041
Sockeye	0.004	0.057	0.056	0.015	...	...	0.027
Total salmon	0.057	0.081	0.075	0.031	...	...	0.068
Rainbow trout	...	...	...	...	...	...	0.025
Grayling	...	...	...	...	...	...	0.437

From 1980 to 1983 the estimated angler use of the lower section declined 574 angler-days (41%)(Table 6). This is probably because the land owners adjacent to the stream now charge a trespass fee, and that section of the river is open only to fly fishing during June and July.

The middle and upper sections had an increase in fishing pressure from 1980 to 1983 of 49 and 58%, respectively. The large increase in the upper section was due primarily to an increase in float fishermen.

In 1983 the estimated grayling catch by float fishermen in the upper section of the Gulkana River was 17,952 which was 86% of the catch for the entire river. The grayling catch by upper section float fishermen in 1983 was 272%, or 13,124 more than in 1980. Even with this large increase in the grayling catch, there was no significant difference noted in the size of grayling caught (Table 7). This is probably because most of the grayling caught (93%) in the upper section by float anglers were released.

Chinook Salmon Escapement Surveys

In July and August cloudy weather and rain resulted in unfavorable aerial counting conditions. Count figures presented in Table 8 should be considered minimum. These counts were conducted by biologists from the Commercial and Sport Fish Divisions.

From 1971 through 1982 Gulkana River chinook salmon escapements have ranged from 696 to 1,569, and averaged 1,051. The count for 1983 was 1,181. A review of the data shows that 1983 counts on all systems were generally down from 1982. Many of counts made in 1982 were the highest ever recorded. The 12-year average (since 1971) chinook salmon escapement in Mendeltna Creek is 39 fish. In 1983 only 10 were enumerated. Since 1979 there has been a steady increase in the number of sport anglers who fish for chinook salmon at the mouth of Mendeltna Creek. No reliable catch information is available but an overharvest of this small run is strongly indicated. Regulatory measures may be necessary to protect this run of chinook salmon in the future.

There has been some consideration to use the Gulkana and Little Tonsina Rivers as chinook salmon donor stock sources for other areas of the State. The Gulkana River is the most heavily fished salmon stream in the Copper River drainage. The Little Tonsina River has been closed to chinook salmon sport fishing for over 10 years because the run is small and vulnerable. Also recent pathological tests made of chinook salmon from the Little Tonsina River indicate they would not be acceptable donor stock. The most logical stream in the Copper River drainage which could serve as a source of chinook salmon eggs is the East Fork of the Chistochina River. Data in Table 8 indicate a gradual increase in the number of returning spawners. This stream is a considerable distance from the road system and is not known to have any sport fishing effort and harvest.

Table 6. Estimated Angler Days of Effort on the Gulkana River, 1975-1980 and 1983.

Date	Stream Section			
	Lower	Middle	Upper	Total
1975	639	803	1,292	2,734
1976	872	982	867	2,721
1977	780	1,550	1,576	3,906
1978	942	1,613	2,510	5,065
1979	1,182	4,232	2,364	7,778
1980	1,384	2,625	3,784	7,797
1983	810	4,919	5,978	11,707

Table 7. Arctic Grayling Length Data for Gulkana River, 1968 and 1978-1983.

Year	Number of Fish	Length Range (mm)	Average Length (mm)
1968	100	177-425	290
1978	190	177-425	294
1979	146	86-420	273
1980	137	95-400	268
1981	145	190-390	287
1982	307	130-385	272
1983	412	152-385	296

Table 8. Chinook Salmon Aerial Surveys, Upper Copper River Tributaries, 1977-1983.*

Stream	1977	1978	1979	1980**	1981**	1982	1983
Gulkana River	924	1,136	1,052	696	N/C	1,569	1,181
East Fork Chistochina River	132	137	765	575	120	1,260	575
Mendeltna Creek	73	52	5	3	87	70	10
Kaina Creek	91	125	279	247	191	200	166
Grayling Creek	N/C	92	153	66	107	124	287
Little Tonsina River	35	285	285	70	191	440	350

* The figures are actual counts and not estimates. These data are considered as minimum escapement figures.

** Counting conditions in 1980 and 1981 were very poor due to high, muddy water during most of the season. Poor water and weather conditions made a count of the Gulkana River impossible in 1981.

N/C No counts made.

Gulkana River Arctic Grayling

In 1983 length and scale samples were taken from sport-caught Arctic grayling from the upper Gulkana River (Figure 3). This information has been collected annually for several years to determine the size of grayling caught by sport fishermen. The samples were secured by Department personnel using sport gear while floating the Gulkana River from Paxson Lake to Sourdough.

During the trip made in 1983, 412 Arctic grayling were captured with sport gear. Fork lengths and scale samples were taken from all fish caught.

A comparison of grayling lengths from 1968 through 1983 is shown in Table 7. The weighted average of all grayling measured from 1968 through 1982 is 280 mm fork length. The average fork length for grayling caught in 1983 is slightly larger at 296 mm.

Figure 4 shows the number of fish in each size group. These size groups approximate the fork length range of Age I+ to Age VI+ fish. The 1983 findings are very similar to past years; however, there is a strong indication of a gradual reduction in the number of Arctic grayling over 382 mm fork length. The predominant size groups continue to be 230-279 mm and 280-330 mm which approximates Ages III+ and IV+.

During the fish collection trip grayling were caught at a rate of 8.24 fish per hour (FPH). The catch per hour in that portion of the Gulkana River above the falls was higher (9.5 FPH) than below the falls (5.2 FPH).

The 360 grayling taken above the falls ranged from 210-385 mm fork length and averaged 301 mm. Fifty-two grayling caught from the river below the falls area ranged in fork length from 152-340 mm and averaged 262 mm.

The Gulkana River grayling catch is one of the highest in the State. The total estimated catch of grayling from the river in 1983 was 20,871 (Table 2). Eighty-six percent (17,952) of the fish were caught by float fishermen. During 1983 the float anglers kept only one of every 14 caught.

Steelhead Trout - Gulkana River

A cooperative study of steelhead trout in the Gulkana River was initiated in 1982. This study is being conducted by personnel of the U.S. Bureau of Land Management, the Sport Fish Division of the Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service.

The purpose of this study is to determine age, size, distribution and timing of mature steelhead trout on their spawning migration. Location of overwintering and spawning areas in the upper Copper River drainage are of primary concern.

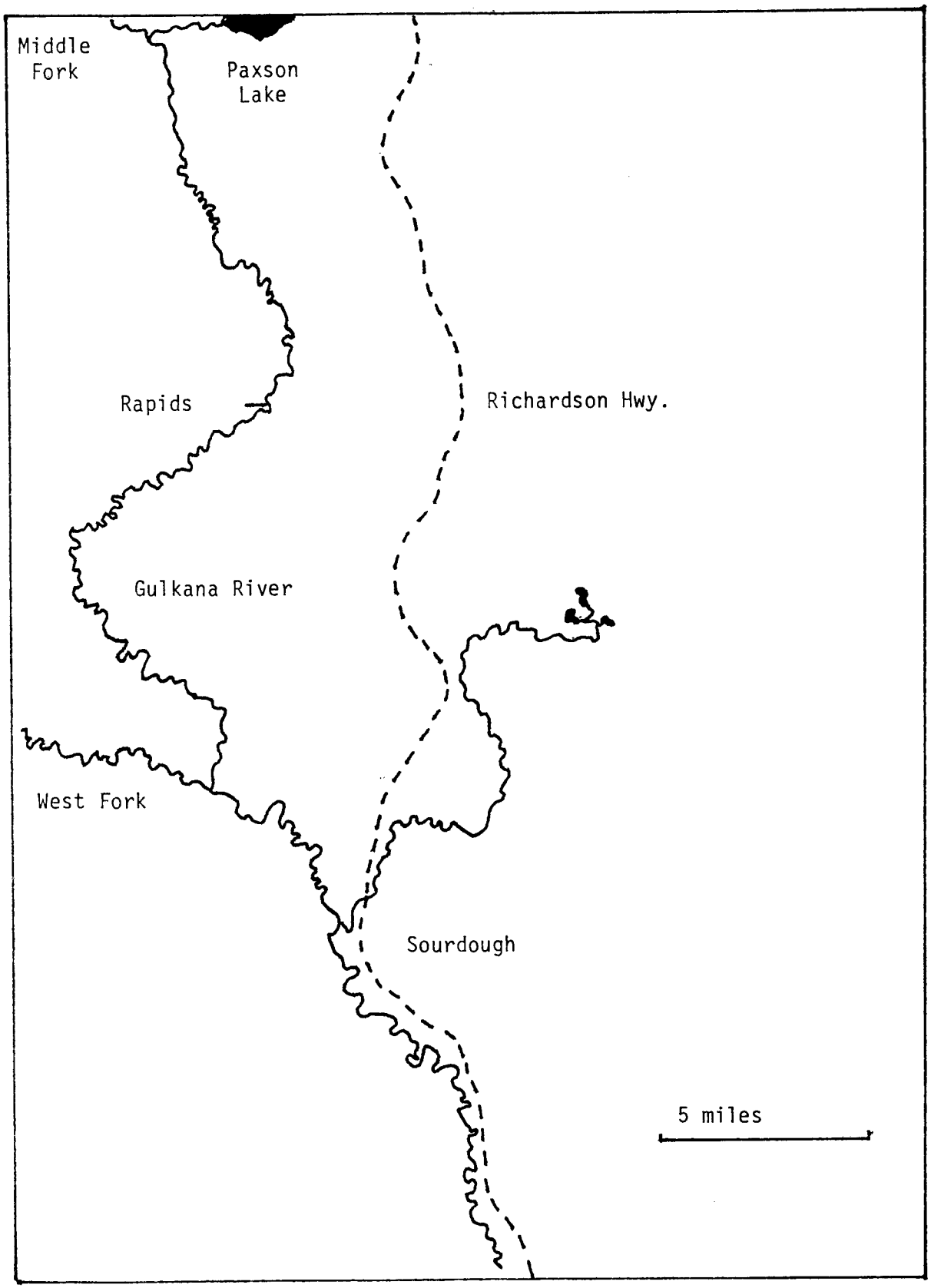

Figure 3 . Gulkana River

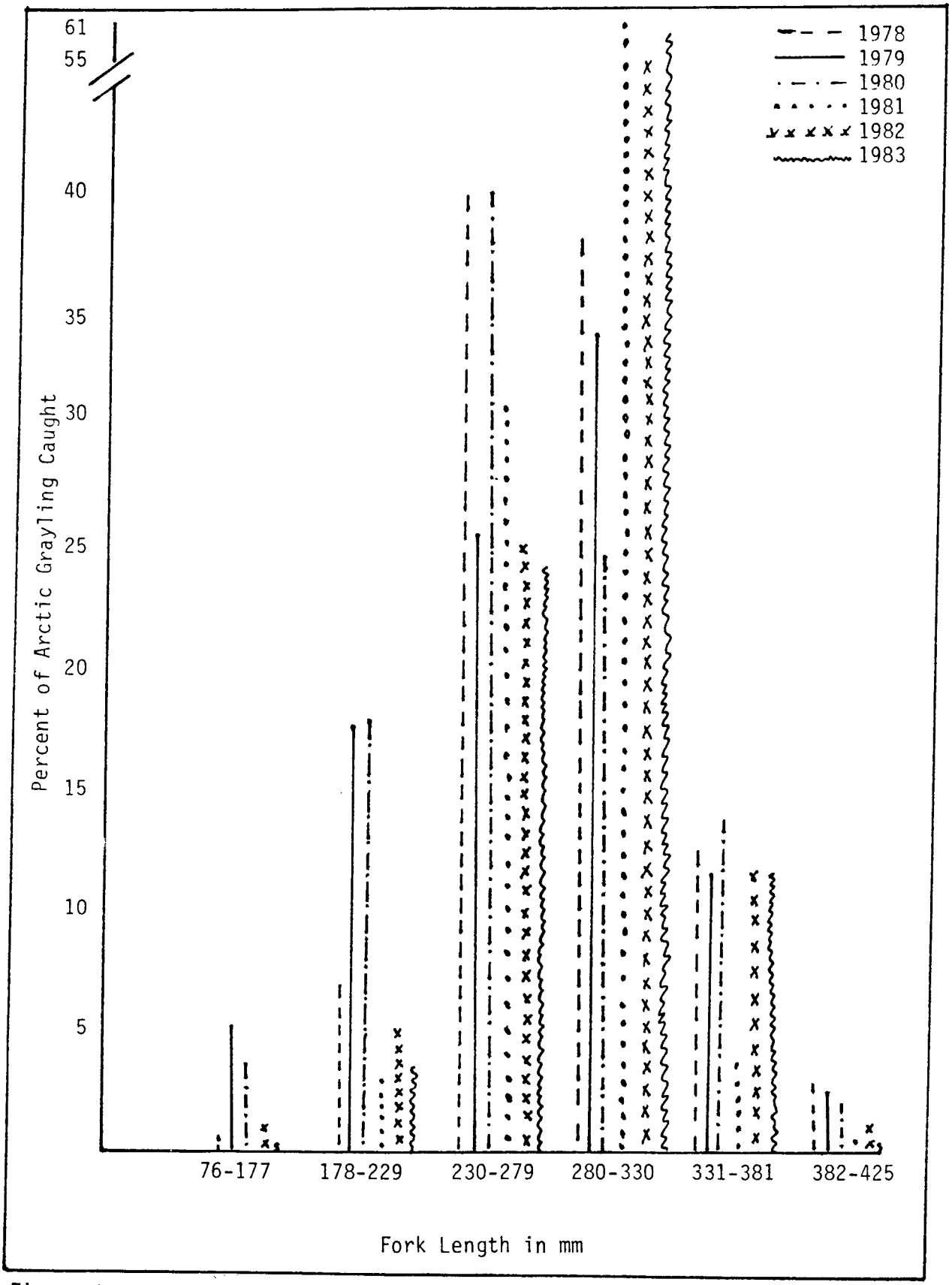

Figure 4. Length Frequency of Gulkana River Arctic Grayling, 1978, 1979, 1980, 1981, 1982, and 1983.

In the fall of 1982, 32 steelhead trout were captured in fishwheels located in the Copper River below the mouth of the Gulkana River (Williams and Potterville, 1983) (Figure 5). High frequency radio transmitters (150 MHz) were surgically implanted in 25 of the steelhead trout. These fish were tracked from aircraft equipped with antenna and receiver equipment. The radio-equipped fish all showed initial downstream movement after they were released. This response may have been due to handling stress. Shortly after release, two of the fish disappeared or the transmitters malfunctioned, and were never located.

By mid-October most of the tagged fish had resumed their upstream migration. This upstream migration averaged 2.2 miles per day until freeze-up when the fish took up winter residence in specific locations. There was very little movement of the fish until May when upstream migration commenced at a rate of up to 12.4 miles per day.

Six overwintering areas were located in the Gulkana River and seven were found in the Tazlina River. Apparently deep pools were selected in these rivers because of ice depth and water availability. Three tagged fish overwintered in the Copper River, then migrated into the Gulkana and Tazlina River drainages for spawning.

Eight spawning areas were located in the Gulkana River drainage and six found in the Tazlina River and its tributaries. The use of Hungry Hollow Creek in the Gulkana River drainage and Durham and Kaina Creeks in the Tazlina River are new records of distribution for steelhead trout. Three fish used Hungry Hollow Creek which is within a noncompetitive oil and gas lease area. Steelhead trout spawning in the Middle Fork of the Gulkana River and its tributaries are the northernmost populations presently known in Alaska.

The Gulkana River steelhead trout telemetry study was continued in 1983. To obtain steelhead for this study, two fishwheels with live boxes were fished in the Copper River during September and October, 1983. In 1983, as in 1982, fishwheel number I (Figure 5) was located 12 miles below the confluence of the Gulkana and Copper Rivers, while fishwheel number II was an additional 1 mile downstream. In 1982-83 all steelhead trout captured in fishwheel number III utilized the Tazlina River drainage for spawning. In an effort to limit the steelhead trout catch to fish destined for the Gulkana River drainage, fishwheel number III was not utilized for the 1983 study. The 1983-84 telemetry study was started on September 8, 1983. Twenty-two steelhead trout had been captured by September 23 when high water conditions forced the temporary termination of this portion of the program. Fishwheel capture of steelhead trout was reinitiated on October 3 and continued until October 6. The fishwheels fished a total of 18 days and 27 steelhead trout were captured and tagged with orange Peterson disc tags; 25 of these steelhead were anesthetized and surgically implanted with high frequency radio transmitters.

Thirteen transmitters used had a battery life expectancy of 9 months, ten had a battery life of 18 months, and two had an expected life of 12 months. The 12 and 18-month transmitters were used in an attempt to

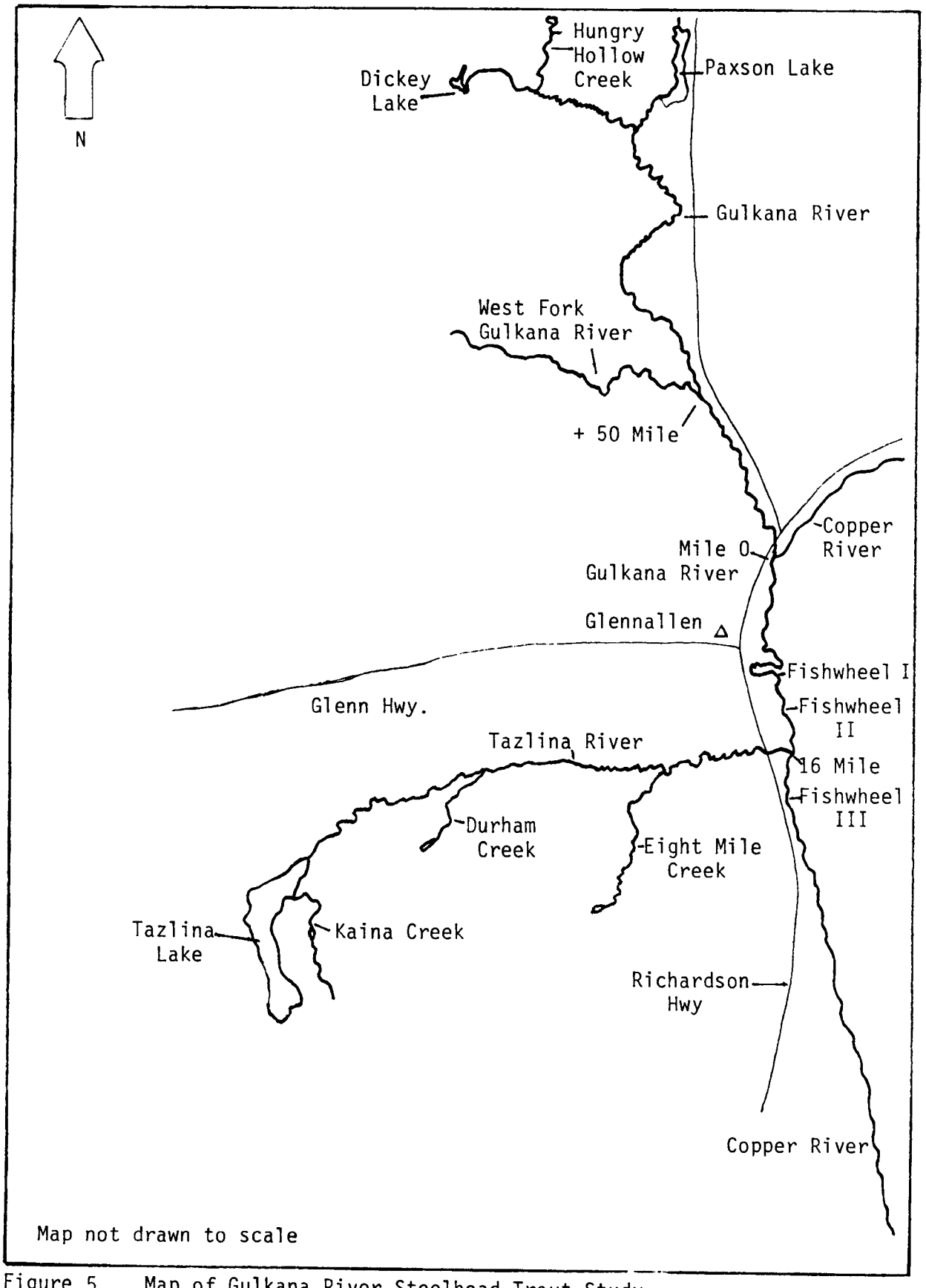

Figure 5 . Map of Gulkana River Steelhead Trout Study.

minimize loss of fish contact at spawning time in the spring. Immediately after the intraperitoneal implant the transmitters were checked to affirm that they were functioning properly.

Three surgeons and two different insertion locations were used for the implants; all surgeons utilized the same techniques in surgery. Twelve of the steelhead had the transmitter insertion posterior, and 13 anterior to the pelvic girdle. Transmitters were inserted into the peritoneal cavity and the antenna was positioned into a "figure 8" pattern. Findings to date indicate no difference in survival or migrational tendencies between fish with transmitter insertion anterior or posterior of the pelvic girdle.

A Telonics scanning receiver and directional antenna is being used in aerial tracking of the steelhead. Aircraft tracking flights have been made at approximately 10-day intervals with plans to reduce the schedule to monthly flights during the winter months. In an attempt to correlate fish migration to water temperatures, a Peabody Ryan Model J thermograph was installed in the Gulkana River.

As of November 29, 15 steelhead remained in the Copper River (Table 9). Five of the steelhead trout had moved upstream into the Gulkana River and five had been lost. Two of the five lost steelhead trout had been tracked until the November 29 flight when the signals were not found; two have never been found and one has not been located since October 14 when it was 21.5 miles below the mouth of the Gulkana River. Lost signals are attributed to movement into unmonitored waters or transmitter deficiency. Fish number 13 has moved upstream the farthest in the Gulkana River still migrating.

Scale samples (N = 27) were collected at tagging time for age determination. The population of sampled steelhead had eight age classes including three age classes of repeat spawners (Table 10). Three fish with regenerated nuclei are not included in this computation as fresh water ages are unknown. Age 3.2 steelhead made up 40% of the sample with 60% of them being female. This dominance of Age 3.2 female steelhead is in accord with previous findings (Wallis, 1981 and Williams and Potterville, 1983). Sex ratios for the combined age groups are 1:1. Their recorded sex ratios are in agreement with findings on the Situk River (Jones, 1983).

At this early date it is difficult to compare the 1983 and 1984 radiotagging studies. The migrational tendencies shown by the steelhead trout in 1983-84 are to move upstream faster and farther after transmitter implantation than the 1982-83 fish.

Tazlina River

On June 22 and 23, 1983 a float trip was made on the Tazlina River from Tazlina Lake to the Richardson Highway bridge. During this 50-mile trip, tributaries of the Tazlina River were checked to determine their spawning and rearing potential for various species of fish including grayling, salmon and steelhead trout.

Table 9. Gulkana River Steelhead Trout Radio Tag and Migration Data, 1983.

Fish #	Fork Length (mm)	Sex	Capture/ Release Date	Fishwheel Capture/ Release Site1/	Peterson Disc Tag #	Transmitter	Radio Frequency	Tracking Results on 11/29/832/
1	673	F	9/09/83	II	000	T93/	150.883	Not found
2	565	M	9/11/83	II	001	T9	150.842	Gulkana -17.5
3	724	Unknown	9/11/83	II	002	T184/	150.345	Gulkana -15.25
4	819	M	9/11/83	II	003	T18	150.273	Not found
5	743	Unknown	9/12/83	II	004	T18	150.223	Gulkana -10.5
6	781	M	9/12/83	II	005	T18	150.292	Not found
7	616	M	9/13/83	II	006	T9	150.911	Gulkana -14
8	775	F	9/13/83	II	007	T9	150.923	Gulkana +2.5
9	775	Unknown	9/13/83	II	008	T9	150.932	Gulkana -15.5
10	660	F	9/13/83	II	009	T9	150.941	Not found
11	737	M	9/13/83	II	010	T9	150.962	Gulkana +13.5
12	686	M	9/13/83	II	011	T9	151.102	Gulkana -14.75
13	762	F	9/14/83	II	012	T9	150.993	Gulkana +65.5
14	584	F	9/14/83	I	013	T9	151.124	Gulkana -6.75
15	527	M	9/15/83	I	014	T9	151.138	Gulkana +44.5
16	679	F	9/16/83	II	015	T18	150.613	Gulkana +3.5
17	711	F	9/16/83	II	016	T18	150.512	Gulkana -20.75
18	584	M	9/16/83	II	017	T9	151.147	Not found
19	610	M	9/16/83	I	018	T9	150.983	Gulkana -17.5
20	782	F	9/17/83	I	019	T18	150.482	Gulkana -7.5
21	730	F	9/19/83	II	020	T18	150.633	Gulkana -15.75
22	762	M	9/20/83	I	022	T18	150.570	Gulkana -13.5
23	800	M	10/04/83	I	None	ATS-125/	151.428	Gulkana -15.75
24	724	F	10/04/83	I	None	ATS-12	151.413	Gulkana -26
25	699	F	10/06/83	I	026	T18	150.454	Gulkana -24.5

1/ See Figure 5.
2/ Most current field observations.
3/ T9 = Telonics 9-month transmitter.
4/ T18 = Telonics 18-month transmitter.
5/ ATS-12 = Advanced Telemetry System, 12-month transmitter.

Table 10. Summary of Age Composition and Lengths of Gulkana River Steelhead Trout Radio-tagged in 1983.

Age Class	Number	Percent Composition	Fork Length (mm) Mean	Range
First Time Spawners				
Males				
2.1	1	4%	528	0
2.3	1	4%	616	0
3.1	2	8%	597	584-610
3.2	3	13%	663	565-737
Females				
2.2	1	4%	699	0
3.2	6	25%	688	584-730
Sex Unknown				
3.2	1	4%	775	0
3.3	2	8%	734	724-743
Repeat Spawners				
Males				
3.1 S1	2	8%	791	781-800
Females				
3.2 S1	2	8%	778	775-781
First Time Spawners - Unknown Ages Caused by Regenerated Nucleus				
Male				
R.3	1	4%	762	0
Female				
R.2	1	4%	724	0
Repeat Spawners Unknown Age Caused by Regenerated Nucleus				
R.1 S1	1	4%	819	0
Fish Not Implanted with Telemetry Radio				
Female				
R.2	1		737	0
Unknown Sex				
2.2	1		528	0
3.1 S1	1		737	0

At the time this trip was made the river was below the normal summer level. The river is primarily Class II water (River Difficulty Rating) with a few short stretches of Class III and IV water.

The lower sections of five tributaries of the Tazlina River were investigated. The streams surveyed were Lost Cabin Creek, Durham Creek, Nickle Creek, Eight Mile Creek and Tolsona Creek. These streams were very similar in physical characteristics. Generally they drain tundra-swamp habitat typified by bog type lakes, small stands of white spruce, swamp, black spruce and deciduous trees. Flows varied from 35 to 60 cfs and the widths from 10 to 25 feet. Water velocities are rapid and the banks indicate very little fluctuation. All stream sections examined had fair to good spawning areas for salmonids. Cover was generally fair and provided by large boulders and shoreline vegetation. Water temperatures ranged from 54 to 65° F and the food grade was 2 to 3. Grayling were observed in all of the streams and the presence of steelhead trout was previously established by radio telemetry procedures. The water color was dark brown due to the nature of the watershed. Because of our unfamiliarity with the river, we spent little time at each tributary. Since at least two of these streams are known to be used by steelhead trout (presumably for spawning) a more intensive study is scheduled for next year.

Test Netting - Managed Lakes

Dick Lake, located at Mile 173 Richardson Highway, is 40 acres in size and has a maximum depth of 32 feet. This lake was originally stocked in 1961 with grayling and has been stocked eight times since then with rainbow trout, coho salmon and grayling. Since 1961 test-netting has been conducted 9 different years. In 1983 no fish were captured during test netting (Table 11). The two rainbow trout plants (1962 and 1966) were apparent failures since no trout were ever taken in test nets. Coho salmon were stocked in 1970 and 1972. Test netting in 1971 and 1973 captured a total of only four coho salmon.

The rainbow trout and coho salmon were stocked in Dick Lake when grayling stocks were relatively high. Competition from the more adaptable grayling may have caused the failure of these plants. Winter dissolved oxygen concentrations ranged from 5.5 to 11.0 ppm, which should be acceptable to trout and salmon.

Grayling have been taken with test nets in Dick Lake every year except 1983 when no fish were taken. Prior test-netting results indicated some natural reproduction of grayling. The lake was last stocked with grayling in 1969. In 1975 several Age I+ grayling in the 150 to 170 mm length range were captured. In 1977 grayling as small as 215 mm fork length were caught which could not have been from the 1969 plant. In 1981 only one fish, a 395 mm grayling, was captured in test nets. It is apparent that natural reproduction is not adequate to maintain a viable grayling population in the lake. Grayling will be stocked on a biennial basis to establish and maintain a fishable population.

Table 11. Gill Net Summary of Managed Lakes, Copper River Drainage, 1983.

Name	Location	Number of Fish	Species*	Length Range (mm)	Mean Length (mm)	Frequency**	Percent Composition
Dick	T13N R1W S31	0					
Gergie	T3N R7W S14	109	GR	120-345	179	1.48	63.0
		28	RT	130-200	172	0.64	16.0
		35	LNS	170-495	382	0.80	21.0
Kay	T4N R6W S22	13	GR	165-255	209	0.26	100.0
Kettle (Rock)	T9N R11E S18	11	LNS	270-330	...	0.23	84.0
		1	BB	...	...	0.02	8.0
		1	RT	165	165	0.02	8.0
Tahneta (Gunsight)	T21N R12E S19,20	197	GR	105-365	208	4.64	99.5
		1	LNS		180	0.02	0.5
Scoter	T2N R8W S6	65	GR	100-385	228	1.30	100.0

* GR = Grayling
RT = Rainbow trout
LNS = Sucker
BB = Burbot

** Frequency is the number of fish caught per net hour.

Gergie Lake is located approximately 1 mile south of Mile 155 on the Glenn Highway. The lake has a native population of grayling and suckers. The lake was stocked with rainbow trout in 1961, 1966, 1968 and 1982. Test netting results following the first three plants indicated that the 1961 plant was the only one that was successful. No additional rainbow trout were stocked until 1982 because of limited fish availability and the poor survival reputation of the Ennis stock. The rainbow trout planted in 1982 were Swanson strain. Test netting in 1983 indicated good survival and growth of these fish. The average length of 172 mm is considered good for Age I+ trout in Glennallen area lakes.

Kettle (Rock) lake, located on the Nabesna Road, had a small native population of suckers and burbot when it was stocked with Swanson strain rainbow trout in 1982. Test netting in 1983 captured only one rainbow trout. This apparent low survival is poorer than expected considering the good condition of the fish when stocked and the relatively low population of resident fish. The winter dissolved oxygen concentration, 7 to 8 ppm, is well within the acceptable range for rainbow trout.

Managed Lakes - Rod and Reel Sampling

The success of stocking various lakes in the area is normally determined by test netting and angler harvest. In small lakes it is not always practical to set test nets for the minimum number of hours (16+) since a significant percent of the total population could be caught and killed. For example, Old Road Lake is only 1.5 acres in size. Also, it is not logistically feasible to establish a creel census program for these small fisheries. Testing a lake with rod and reel is sometimes the most practical means of determining whether a fish plant was a success and to secure information on growth. In 1983 five of these lakes were tested with rod and reel and the results are shown in Table 12.

In 1977 Ennis strain rainbow trout were stocked in Tiny Lake. Tiny Lake was sampled in 1978 with rod and reel, and 10 rainbows were caught that ranged in fork length from 149-190 mm and averaged 170 mm. In 1983, 12 Swanson strain rainbow trout, stocked in 1982, were caught that ranged in fork length form 118-207 mm and averaged 174 mm. These data strongly suggest comparable growth rates of the two strains of rainbow trout.

Surveys of Previously Unmanaged Lakes

For several years the Alaska Department of Natural Resources has been conducting a land disposal program which conveys State lands to private ownership. Some of the land being transferred to private ownership is located in the Copper River and Susitna River drainages. Many of these parcels of land are located adjacent to streams and lakes which have not previously been surveyed by the Alaska Department of Fish and Game. To accurately comment on proposed disposals and determine the effects on fisheries within active land disposals, basic biological data must be collected on the affected waters. Normally surveys of these remote lakes are not made because of the time and expense involved and the relatively low fishing effort.

Table 12. Rod and Reel Sampling of Managed Lakes, Copper River Drainage, 1983.

Lake	Location	No. of Fish	Species*	Length Range (mm)	Mean Length (mm)	Catch per Hour	Percent Composition	Last Stocked
Little Crater	T6N R4W S29	3	SS	140-160	152	6	60	SS 1982
		2	RT	177	177	4	40	**
Hallie	T21S R11E S20	2	SS	226	226	2	100	SS 1979
Old Road	T4N R7W S14	2	RT	110-112	111	8	100	RT 1982
Tiny	T4N R7W S16	12	RT	118-207	174	16	100	RT 1982
Round	T4N R7W S14	0	0	0	0	0	0	RT 1982

* SS = Silver salmon (landlocked)
RT = Rainbow trout

** Migrated downstream from 1982 Crater Lake plant

In 1983 we surveyed only four "new" lakes and three of them are within current land disposal areas. If we are going to keep pace with private development on these remote sites, our lake and stream survey program will have to be expanded.

John Lake is located 8 miles north of Mile 140 Glenn Highway. The lake is accessible by all-terrain-vehicle (ATV) and aircraft and is part of the Little Nelchina River drainage (Table 13). Public interest in this lake increased in 1983 when the State of Alaska sold several parcels of property, adjacent to the lake, to private parties. The lake is 1-1/4 miles long and has a maximum depth of 24 feet. Fish taken during test-netting included grayling and suckers (Table 14). This lake has a history of low sport fishing effort; however, this will increase with the anticipated private development.

Big Boot Lake, located 5 miles east of the Lake Louise Road, is within a land disposal area. The presence of staking around the shoreline indicates at least some public interest in the area. The lake is fairly typical of many in the area except that the only fish species taken during test-netting was grayling. The net frequency of 2.3 fish per hour indicates a good grayling population. The absence of associated species such as whitefish and longnose suckers is unusual. This 70-acre lake has a maximum depth of 23 feet and is 90% shoal area. The large amount of shoal area should be a positive factor in productivity and the depths should be adequate to overwinter fish. The inlet and outlet are at the same end of the lake which would have adverse effects on winter dissolved oxygen concentrations. Winter oxygen determinations should be conducted on this lake since the test-netting results indicate potential as a grayling egg-take site.

In 1983 the State of Alaska opened to entry two townships (46,080 acres) about 3 miles east of Lake Louise. Previous to that (1982) we surveyed 12 lakes in the area. As anticipated, there was considerable staking activity adjacent to the lakes that contained fish populations. The entire shoreline around North Jans Lake was staked and claimed by various individuals. North Jans Lake has been used for experimental rainbow trout stocking and has produced excellent sport fishing. Fortunately present land disposal regulations allowed for the retention of public shoreline access and public use sites.

Within the 46,080 acre land disposal unit there were at least 207 lakes over 5 acres in size. During preliminary aerial surveys in 1982 12 previously unsurveyed lakes were selected which appeared to have the most potential for existing fish populations. These were surveyed in 1982. In 1983 Lake Louise East #13 was surveyed. This lake is 16 feet deep and had a surface area of only 18 acres. Twelve grayling, caught in one variable mesh gill net, ranged from 188 to 381 mm fork length and averaged 322 mm. No other fish were taken. These grayling were larger than normally encountered in other lakes within the area and this is probably due to poor spawning areas. Poor spawning conditions result in lower recruitment levels in the population and reduced competition for food and space.

Table 13. Physical and Biological Data from Previously Unsurveyed Lakes in the Copper River Drainage, 1983.

Lake	Surface Area Acres	Maximum Depth (ft.)	Percent of Shoal Area**	Fish Species* Present	Location by Drainage
Big Boot	70	23	90	GR	Tolsona Cr. - Tazlina R.
John	160	24	85	GR, LNS	Little Nelchina - Tazlina R.
Lake Louise East #13	18	16	80	GR	Tolsona Cr. - Tazlina R.
Summit	320	74	10	RT	Tebay R. - Chitina R.

* Species
GR = Grayling
LNS = Suckers
RT = Rainbow trout

** Shoal area includes those areas less than 15 feet deep.

Table 14. Gill Net Summary of Previously Unsurveyed Lakes, Copper River Drainage, 1983.

Name	Location	Number of Fish	Species*	Length Range (mm)	Mean Length (mm)	Frequency**	Percent Composition
Big Boot	T5N R6W S20, 29	53	GR	135-295	247	2.30	100
John	T4N R9W S20, 29	51	GR	175-305	222	1.29	58
		37	LNS	210-460	378	0.74	42
Lake Louise East #13	T6N R6W S4	12	GR	188-381	322	0.63	100
Summit	T6N R7W S28-33	21	RT	140-710	520	0.36	100

* Species
GR = Grayling
LNS = Sucker
RT = Rainbow trout

** Frequency is the number of fish caught per net hour.

In 1983 a joint field trip with personnel from the National Park Service was made to Summit Lake, located 16 miles southeast of Chitina. This lake is located in the Chugach Mountains, within the Wrangell St. Elias National Park, at an elevation of 2,818 feet. The lake is accessible only by aircraft or hiking. Summit Lake is 2.5 miles long and has a surface area of approximately 320 acres. The maximum depth recorded is 74 feet and about 10% of the lake is shoal area (15 feet or less). Two variable mesh gill nets were set and 21 rainbow trout were taken overnight. The fish ranged in size from 140-710 mm and averaged 520 mm fork length (Table 14). Seven rainbow trout were also taken with rod and reel. These fish ranged in fork length from 580-740 mm and averaged 678 mm.

Scales taken from 22 of these fish were analyzed for age (Figure 6). Although this is a small sample of fish, the lack of Age III and IV fish is unusal. Variable mesh nets have five different mesh sizes so it is possible to catch most size and age groups.

Three of the females examined had mature eggs in the skein and the condition of these eggs (loose) indicated the fish should spawn this year. Also two of the males had enlarged gonads in spawning condition. Some of the other females examined were spawned out.

This preliminary survey was conducted on August 23 and 24, 1983. Surface temperature of the lake was 52°F. The water was very clear and, despite overcast and rain, fish could frequently be seen from shore. The outlet had a surface temperature of 53°F and the water was also clear. The bottom was comprised of clean rock, gravel and sand and appeared to be ideal for spawning. No barriers to fish passage were noted in 300 yards of outlet stream checked; however, aerial observations revealed some torrential areas in the 5 miles of stream between Summit Lake and Tebay River. The two major inlets to the lake were flowing approximately 2 cfs each when checked. They had some limited spawning areas, however, the water temperature was 40°F.

Because of the relatively high altitude of Summit Lake, 2,818 feet, water temperatures in the summer probably remain cool. Spawning is limited to small areas in the inlets and outlet and possibly on the shallow gravel shoals in the lake. The temperature of the inlet water may also be a limiting factor. Spawning is probably sporadic throughout the summer from ice-free to just before freeze-up. Observations of spawning rainbow trout in a similar lake in Wyoming (Williams, Pers. Comm.) showed that only slight changes in the temperature of the inlet streams could cause trout to temporarily cease spawning activities and these kind of water temperature fluctuations may go on all summer.

The rainbow trout in Summit Lake are the largest non-anadromous rainbow trout known in the Copper River drainage. More field investigations will be made to determine: if all age classes do exist in the lake; relative abundance of these large rainbow trout; document the apparent unusual spawning activities occurring in the lake; complete sounding and mapping activities; and conduct preliminary fish food organism studies.

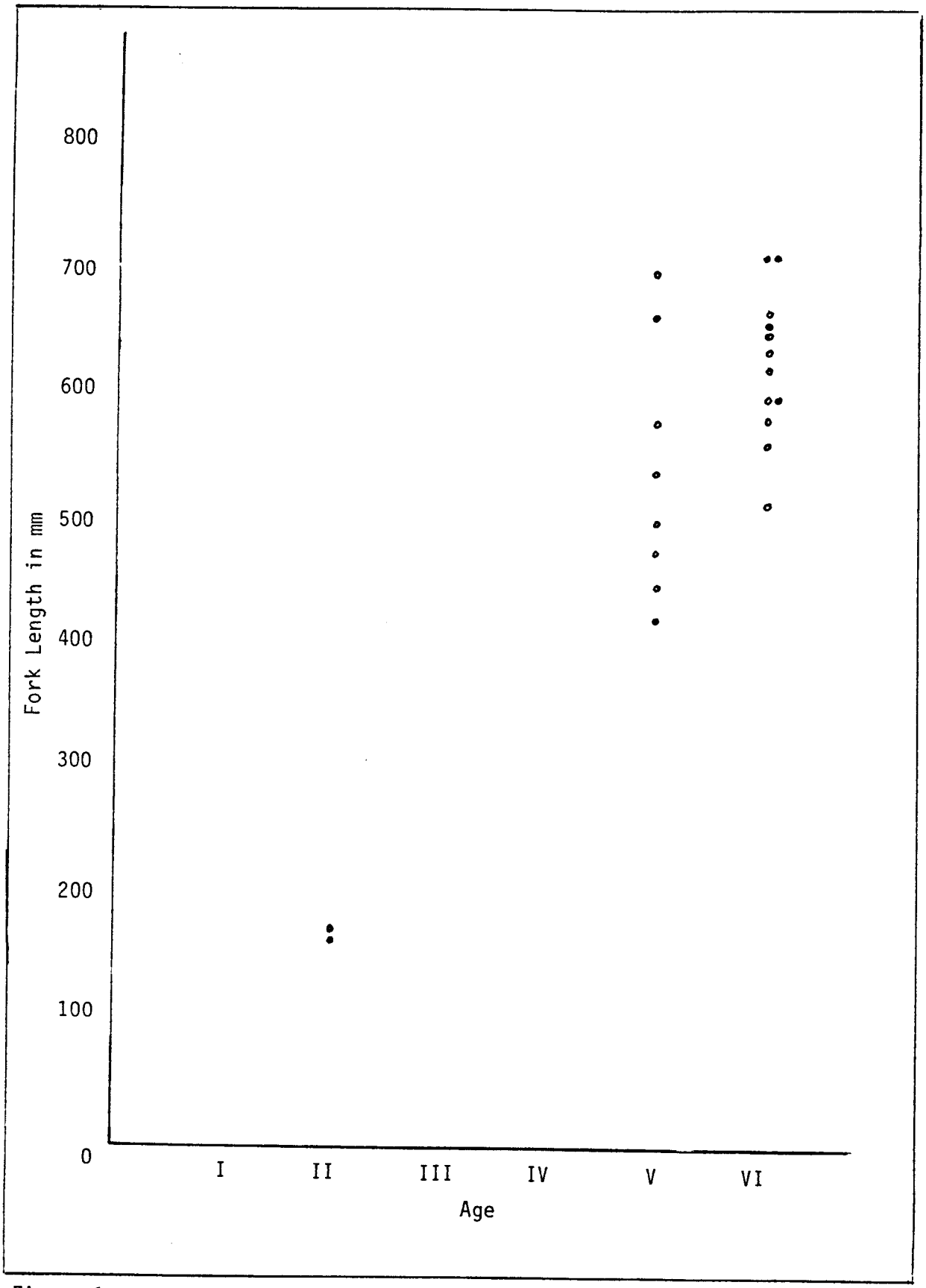

Figure 6. Age Length Relationship of Summit Lake Rainbow Trout, 1983.

Grayling Egg Take Investigations

In 1983 three lake systems, Tolsona-Moose, Jack and Gillespie, were selected for grayling egg take experiments. Our Creek, tributary to Moose Lake, had been used in the past as an egg take source. The last egg take was conducted in 1970. Trapping efforts were conducted sporadically since that time with poor results; however, recent test-netting (1982) indicated an increase in the grayling population. Our Creek is located about 3.5 miles north of Mile 170 Glenn Highway and is accessible by ATV.

A trap was installed in Our Creek on May 4, 1983 when the water temperature was 37°F. On May 5, the water temperature rose to 38°F and 512 grayling were trapped. Trapping was discontinued on May 9 after a total of 1,274 grayling were collected. Six hundred seventeen fish were females and 657 were males. During the two egg takes that were made, 255 females were stripped, 16 were immature, 267 were still green and 79 had bloodly eggs and were not used. The high (13%) incidence of bloody eggs is unusual and no explanation was forthcoming. The fish were held either 5 or 8 days before being stripped and yet 43% (267) were still green and unusable. No doubt some of the green fish were immature but normally grayling ripen more rapidly than this. A total of 1,033,840 eggs were taken. Females stripped during the first egg take averaged 4,335 eggs each and 3,640 eggs in the second egg take. The difference in the number of eggs is probably because egg takers usually select the larger fish first, also, the larger females appear to mature earlier. It was noted that the grayling did not move into Our Creek from Moose Lake until the creek water reached 38°F, which occurred between 12:30 p.m. and 3:30 p.m. This temperature preference has been noted in Poplar Grove Creek and Bessie Creek, the inlet to Tolsona Lake. Five hundred of the trapped grayling were marked by removal of the adipose fin to determine percent of repeat spawners in 1984.

Previous investigations revealed a good population of grayling in the Jack Lake system. This system is part of the Nabesna River drainage and is located close to the Nabesna Road. Traps were installed in the stream between Big Twin Lake and Jack Lake (inlet to Jack Lake) on May 10, 1983. By May 18 a total of 555 grayling were caught. On that day 214 female grayling were stripped and a total of 751,225 eggs were taken. The females averaged 3,510 eggs each. In contrast to Our Creek only 3% of the females handled had bloody eggs. There are several other inlets to Jack Lake which will be investigated during the spring of 1984.

Plans had been made to install a test weir in Gillespie Creek to determine the magnitude of the grayling run. The Gillespie Creek drainage is composed of four lakes that all have natural grayling populations. This small system is part of the Gakona River drainage. The site selected for trapping is adjacent to the Richardson Highway. Because of commitments to Our Creek and the Jack Lake system, manpower was not available for Gillespie Creek until the water temperatures had reached 40°F and that phase of the grayling egg take investigations was abandoned for the year.

Bessie Creek is the largest inlet to Tolsona Lake and flows from Moose Lake. This stream, for many years our primary source of grayling eggs, was checked daily. The stream was very low and an ice plug was present at the mouth. The stream did not become ice-free until May 14 when the water temperature was 40°F. Only a few grayling were observed in the stream. The stream was not trapped because (1) only a small run developed; and (2) sufficient eggs were secured at Jack Lake and Our Creek.

In 1983 Scoter, Gunsight (Tahneta) and Butte Lakes were investigated to determine their potential as egg take sites. These lakes have been previously surveyed so the investigations were limited to test netting and observations of potential trapping areas.

Scoter Lake is located near Mile 143 Glenn Highway. Fishing pressure is very limited on this 80-acre lake because it is not visible from the highway and the best access is by a private road. This lake was first surveyed in 1966 and grayling were taken with test gill nets at a frequency of 1.67 per hour. Test netting in 1983 caught grayling at a net frequency of 1.30 per hour (Table 11). The fish caught in 1983 ranged in fork length from 100 to 335 mm and averaged 228 mm. Forty-one grayling (63%) were over 220 mm, close to the minimum size desired by egg takers.

Samples of Scoter Lake grayling were sent to the fish pathology laboratory in Anchorage and found suitable for brood stock use. However, the location of the outlet could make it awkward for installing and tending a trap and the soft lake bottom is not optimum for fyke netting. The lake is only lightly utilized by anglers, and test trapping will be conducted in 1984, if logistics permit.

Gunsight (Tahneta) Lake was investigated as a grayling egg take site because of its size and proximity to the road system. The lake is located adjacent to Mile 123 Glenn Highway and has a surface area of 180 acres. Test netting in 1983 caught 197 grayling that ranged in fork length from 105-365 mm and averaged 208 mm (Table 11). Forty eight percent of the fish captured were over 200 mm in fork length. The net frequency was 4.64 grayling per net hour.

Gunsight Lake has a maximum depth of 6 feet and while no winter dissolved oxygen determinations have been made it is unlikely that fish could overwinter. The grayling that were taken in gill nets during the summer of 1983 may have migrated up Eureka Creek into the lake or dropped down out of Liela Lake. The grayling in this lake were cleared pathologically for brood stock use and experimental trapping will be conducted in 1984. The physical configuration of the inlets and outlet are conducive to trapping operations. The lake is situated at an altitude of 2,966 feet which means it will be ice free about 2 weeks later than other lakes scheduled for experimental grayling trapping.

Butte Lake is located about 5 miles southwest of Mile 96 on the Denali Highway. This 680 acre lake is situated at an altitude of 3,354 feet and is part of the Susitna River drainage. A trap was installed at the mouth of the largest inlet, located on the east end of the lake, on June

2. The lake was approximately 99% ice covered at this time. The inlet stream temperature varied from 34°F to 39°F during the first two days. Five grayling were taken during the first two days of trapping and none were ripe. Trapping was continued until June 8 and 46 grayling were taken. Ten females and 12 males were spawned and 31,400 eggs were taken. The remaining fish were green. The water temperature of the inlet had reached 43°F by the eighth of June.

The outlet of Butte Lake was surveyed and four grayling were taken with rod and reel. All four of the fish appeared to be immature. The outlet temperature was 39°F. This lake has a reputation for good grayling fishing. This was corroborated by a short field trip made to the lake by ADF&G, F.R.E.D. personnel in the summer of 1982. The cursory investigations conducted in 1983 were hampered by inclement weather conditions and almost total ice cover on the lake. The inlet and outlet streams that were examined would not be difficult to trap and additional investigations are planned for this potential grayling egg-take site. Grayling taken from the lake in 1982 were examined by the pathology laboratory and cleared for egg taking purposes.

Swanson Strain Rainbow Trout Population Estimates

Population estimates were initiated on five lakes in 1983 that had been stocked with Swanson strain rainbow trout in 1982. These studies were subsequently discontinued in David, Mary Lou and Katherine Lakes due to low catches of trout. Trapping with baited double-cone minnow traps in David and Katherine Lakes produced only one rainbow trout each in 813 and 990 trapping hours, respectively. One hundred sixty-one rainbow trout were caught during 1,214 trapping hours in Mary Lou Lake. It is suspected that the Swanson strain rainbow trout were able to migrate out of these lakes through the wire mesh outlet structures.

Population estimates were completed on Tex Smith and Little Junction Lakes. Tex Smith Lake was first surveyed in 1952 and rehabilitated the following year with rotenone to eradicate a heavy longnose sucker population. The lake has been stocked 20 times with rainbow trout since 1953 and has consistently produced a good sport fishery. The conductivity is 404 micromhos/cm which makes Tex Smith Lake one of the richest in the Glennallen area. Swanson strain rainbow trout were stocked in Tex Smith Lake in 1979, 1981 and 1982. The 1982 stocking was made in August and consisted of 5,000 fish at 350 per pound. Eleven months later they were recaptured in baited double-cone minnow traps. Fork lengths ranged from 75 to 210 mm and averaged 122 mm. Age 1+ rainbow trout population estimates in Tex Smith Lake in 1983 are 35% of the 1982 plant or 1,728 rainbow trout. The 95% confidence interval of 24 to 53% gives a range of 1,186 to 2,630 1982 Swanson strain rainbow trout remaining in Tex Smith Lake (Table 15).

Little Junction Lake was stocked in 1978 with Arctic grayling and in 1982 with Swanson strain rainbow trout. The Arctic grayling population was well established at the time the rainbow trout were planted. In April 1983 dissolved oxygen levels dropped to 1.0 ppm. The same methods and means were used to determine population estimates as in Tex Smith

Table 15. Swanson Strain Rainbow Trout Population Estimates in Tex Smith and Little Junction Lakes, 1983.

Lake	Date Stocked	Number Stocked	Population Estimate	Percent Survival	95% Confidence Interval
Tex Smith	8/11/82	5,000	1,728	35	24-53
Little Junction	9/09/82	2,000	235	12	6-39

Lake. In September 1982, 2,000 rainbow fry at 345 per pound were planted and 10 months later fish recaptured in minnow traps ranged in fork length from 105 to 155 mm and averaged 121 mm. Twelve percent (235) of the Swanson strain rainbow trout survived to Age 1+. The 95% confidence interval ranges from 6 to 39% or 124 to 783 fish, respectively. Twelve percent survival is considered good for rainbow trout stocked in lakes containing an existing population of grayling and extremely low winter dissolved oxygen concentrations.

Habitat Protection

During the year, proposals on over 75 different projects which had potential for degrading fisheries habitat were received for comment. Many of these proposed projects required field investigations prior to making recommendations. The projects investigated involved other State agencies, municipalities, Federal agencies, public utilities and numerous construction organizations and individuals.

Two important proposed projects that are being studied are at 6-14 mile and 16-17 mile on the Richardson Highway. The proposals are for highway re-alignment and widening. The proposed construction will bisect a beaver pond which serves as a coho salmon spawning and rearing area; cross several important tributaries of the Lowe River, which serves as a spawning and rearing area for coho, chum, pink and sockeye salmon; reduce the width of the Lowe River in Keystone Canyon, which serves as a migration system for coho salmon and Dolly Varden. In addition, rock removal work will require extensive blasting in the Keystone Canyon section.

Several field inspections were made with representatives of the Department of Transportation to make changes in the original plans that would provide adequate protection for the fish resource from blasting, reduce the anticipated increase in water velocity to allow for fish passage and to provide for mitigation of fish habitat losses. A joint study will be conducted by the Department of Transportation and ADF&G during blasting to determine the effects on salmonids. The results of this study will dictate blasting techniques to be used during the construction phase of the project.

The State land disposal program was continued during 1983. Several parcels of land in this area were nominated for disposal and some areas were open to entry. To protect fisheries, or fisheries potential which might exist within the areas of concern, field investigations and file review was necessary. Recommendations were made which would retain public access and protect fisheries habitat. The methodology seems to be working and fisheries values are receiving priority attention.

The anticipated changes in status of the Gulkana River from non-navigable to navigable will require some changes in the Gulkana River plan which was recently agreed on by the State and Bureau of Land Management. Meetings and planning teams have been set up to establish guidelines and policy for more detailed management of the river on a cooperative basis by the BLM and State of Alaska.

Valdez Stream Surveys

Surveys of eastern Valdez Bay salmon spawning streams (Table 16, Figure 7) were continued in 1983. Annual enumeration of salmon from 1974 through 1983 is shown in Table 17. Five of the eight index pink salmon streams surveyed had a significant decrease in numbers of fish from 1981, the parent year. This may have been caused by any one or a combination of the following factors: (1) in August 1981, heavy rains created flood conditions in the streams at the eastern end of the bay, which may have washed deposited salmon eggs from their redds; (2) a commercial cargo dock, situated in the eastern end of Valdez Bay, was completed and ships began using the facility, which may have interfered with migration patterns of both juvenile and adult salmon; (3) in July 1983 Valdez Fisheries Development Association (VFDA) in conjunction with their PNP Solomon Gulch Hatchery was allowed to seine 76,000 adult pink salmon from eastern Valdez Bay, which may have resulted in harvesting salmon destined for other streams; (4) in 1981 Solomon Gulch Hatchery used 7,075 donor stock pink salmon from Siwash Creek for their egg source, which represented 23% of that year's enumerated escapement. In 1983 the enumerated escapement was 25% less than in 1981. Three of the streams surveyed had higher than expected numbers of adult pink salmon. These were the Lowe River system (#11370), City Limits Creek (#11450) and Mineral Creek (#11470). However, the total number of adult pink salmon enumerated in all index streams in 1983 was almost 33% less than the parent year. In 1981 the total count of pink salmon was 75,251, and in 1983 it was 50,769.

Valdez Fisheries Development Association's Solomon Gulch Hatchery has an Alaska Department of Fish and Game permit to seine salmon in the special harvest area (SHA). These salmon are to be surplus to the egg take needs of the private non-profit hatchery and to be sold to defray the cost of hatchery operations. During this commercial seining operation in 1983, 239 pink salmon were tagged with spaghetti-type tags and released. In late July and early August, four of the tagged fish were found in 6.5 Mile Creek which is part of the Lowe River system (Figure 7). In addition, three of the tagged fish were recovered from anadromous stream 221-60-11364 upstream from Dayville Road and four were recovered from Siwash Creek (the donor stream).

In 1981 when these pink salmon fry were released near Solomon Gulch Stream, 8% of the estimated 7.4 million fish were marked by removal of the left ventral fin. During stream surveys, 11 ventral-clipped pink salmon were found in Crooked Creek and three in anadromous stream 11364 near Dayville Road. These data and the tag recovery information suggest some wandering of returning adult pink salmon and proves that some of the pink salmon "schooling" off of the mouth of Solomon Gulch Creek in the SHA were destined for other streams and harvested by Solomon Gulch Hatchery. It is apparent that some of the pink salmon harvested by the hatchery were not the product of their operation.

Coho salmon counts were down in 1983 and several index streams were not surveyed because of budget restrictions. The count in the Lowe River system was 801, which is considerably lower than the previous 8-year

Table 16. Valdez Area Salmon Enumeration Streams.

	Anadromous Stream Number	Name	Count Areas
1.	221-60-11360	Solomon Gulch	Waterfalls downstream. Includes Solomon Gulch hydro-electric power plant tailrace area.
2.	221-60-11364	Dayville Flats intertidal pools	Entire drainage
3.	221-60-11366	Dayville flats intertidal pools	Entire drainage
4.	221-60-11368	Abercrombie	Entire drainage
5.	221-60-11380	Robe River	Entire drainage
6.	221-60-11380-0010	Robe Lake	Outlet area
7.	221-60-11380-2095	Corbin Creek	Entire drainage
8.	221-60-11380-2105	Brownie Creek	Entire drainage
9.	221-60-11380-2107	Deep Creek	Mouth area
10.	221-60-11370	Lowe River System	Selected areas
11.	221-60-11370-2145	4.5 Mile Pit	Outlet and outlet stream
12.	221-60-11370-2165	6.5 Mile Seep	Entire drainage
13.	221-60-11370-2219-3011	8.5 Mile	Entire drainage
14.	221-60-11370-2219	12 Mile	Alpine Woods streams Fire station area streams Sandvick pool
15.	221-60-11370-2317	17 Mile	Entire drainage
16.	221-60-11390	Sewage Lagoon	Entire drainage
17.	221-60-11410	Loop Road 1	Entire drainage
18.	221-60-11420	Loop Road 2	Entire drainage
19.	221-60-11430	Siwash Creek	Entire drainage
20.	221-60-11440	Ess Creek	Lower 1/2 of drainage
21.	221-60-11450	City Limits (Crooked Creek)	Waterfalls downstream through Slough area
22.	221-60-11470	Mineral Creek	Brush (Horsetail) Creek, Blondeau Creek

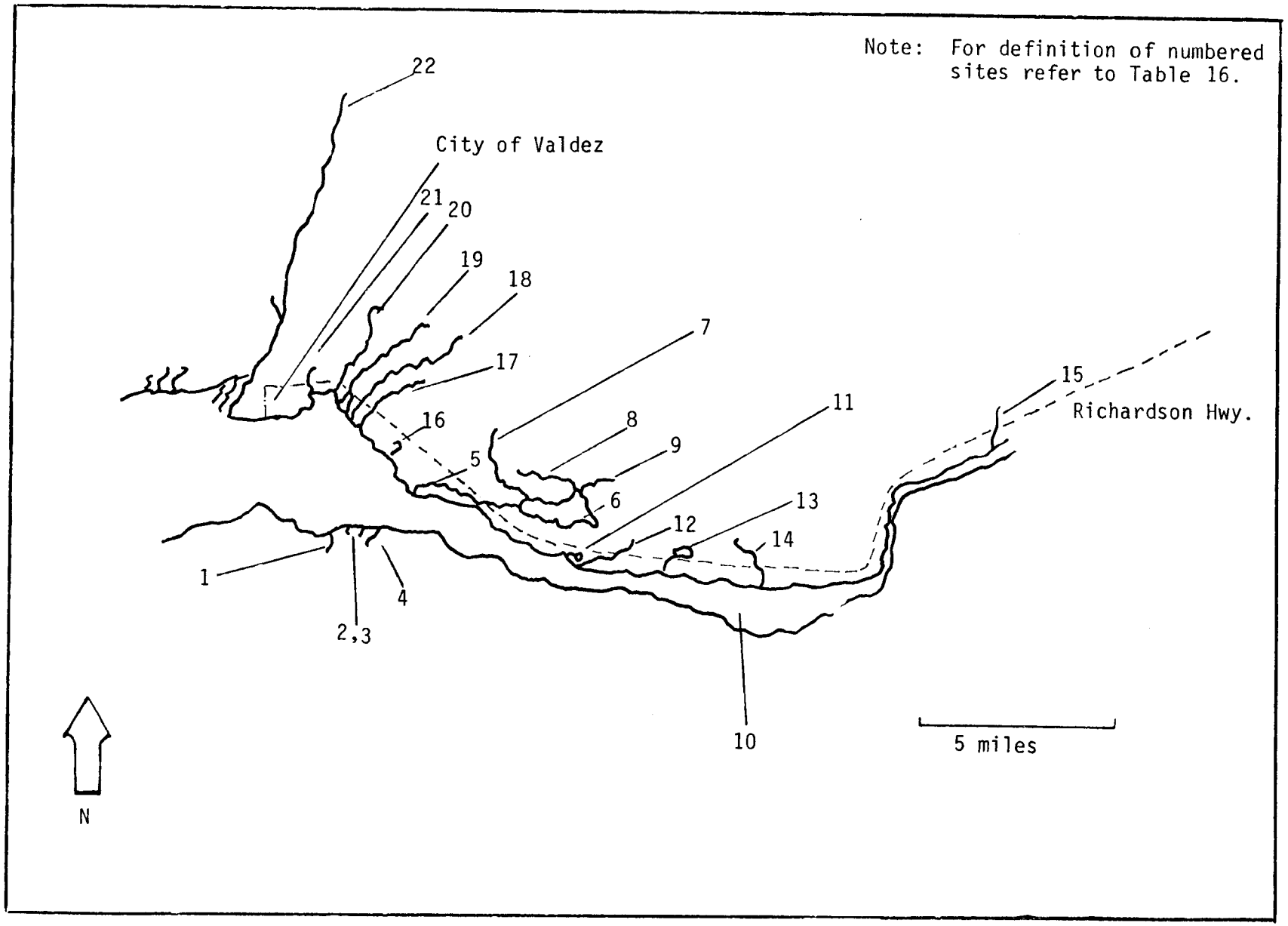

Figure 7. Salmon Spawning Streams, Upper Valdez Bay.

average of 1,927. The Robe Lake system coho salmon counts traditionally include Corbin Creek, Robe Lake and Robe River. In 1983 Robe River and Robe Lake were not enumerated. Previous years' counts of Robe Lake and Robe River accounted for 4 to 49% of the total Robe Lake system coho salmon escapement. Corbin Creek was counted in 1983 and 2,670 coho salmon were enumerated. Corbin Creek is used by the Valdez Fisheries Development Association as an egg-donor site for the Solomon Gulch Hatchery. The number of coho salmon spawners that can be used is dependent on escapement levels.

A scientific and educational salmon hatchery facility operated by VFDA is located on Stream 221-60-11450 (Crooked Creek). In 1983 this facility was non-operational but the stream still is impacted by previous year's pink salmon and chum salmon egg takes and releases and this year's VFDA chum salmon egg take. Chum salmon escapement counts in this stream are conducted by VFDA personnel.

Brownie Creek, a tributary to Robe Lake, accounts for 92 to 99% of the sockeye salmon counted in Valdez Bay streams. Traditionally, as with coho salmon, Robe Lake system sockeye salmon counts include Robe Lake, Robe River and Brownie Creek but the lake and river were not enumerated for red salmon in 1983. The data shown in Table 17 indicate peak runs of red salmon every 2 or 3 years in the Robe Lake system.

Slana River Whitefish Fishery

The Slana River whitefish sport fishery is unique in that it occurs during the month of October, after darkness, and by the use of spears. Lanterns are used for illumination. The normally glacial water becomes clear by October and the whitefish are beginning to spawn. The population is composed of round whitefish and humpback whitefish.

In 1983 measurements of 112 sport-caught whitefish were taken (Table 18) and they averaged 368 mm fork length. The weighted average of 963 whitefish collected from 1964 through 1982 is 361 mm fork length and the weighted average fork length of 1,075 whitefish collected from 1964 through 1983 is 361.5 mm.

The annual harvest of whitefish from the Slana River probably exceeds 3,500. When dog teams were a necessary mode of winter transportation, the harvest of whitefish for dog food was much higher. Also in the past, whitefish were a more important part of the diet for local residents than now.

Although this fishery takes place during the spawning period, the data presented in Table 18 show that it has not been detrimental to the whitefish population in the Slana River.

Table 17. Port of Valdez Salmon Counts, 1974-1983.

	#11390 Sewage Lagoon	#11370 Lowe River System	#11380 Robe Lake System	#11410 Loop Road I	#11420 Loop Road II	#11430 Siwash	#11450 City Limits	#11470 Mineral Creek System
Pink Salmon								
1974	N/C	N/C	N/C	262	N/C	8	98	217
1975	N/C	15,387	2,461	5,537	N/C	33,113	1,262	947
1976	N/C	1	0	18	N/C	5	5	8
1977	1,418	1,441	330	18,718	4,101	22,120	2,714	179
1978	0	0	2	66	0	0	10	0
1979	1,657	1,770	1,546	16,246	6,012	29,232	5,512	53
1980	43	4	454	790	3	214	178	0
1981	2,868	6,500	1,557	18,400	10,593	31,045	3,870	418
1982	49	15	382	449	7	729	78	0
1983	490	8,503	270	6,889	4,239	23,323	6,274	781

	Chum Salmon		Red Salmon		Coho Salmon	
	#11459 City Limits	#11470 Mineral Cr. System	#11370 Lowe River System	#11380 Robe Lake System	#11370 Lowe River System	#11380 Robe Lake System
1974	483	1,454	N/C	3,000	N/C	1,662
1975	N/C	N/C	2	10	1,506	1,533
1976	1,080	564	1	N/C	1,310	1,049
1977	0	0	N/C	9,188	1,363	1,522
1978	111	68	29	972	1,643	5,091
1979	1,277	126	16	2,216	1,536	3,470
1980	2,186	140	0	993	1,329	5,467
1981	3,000	158	20	229	4,516	3,125
1982	5,622	N/C	46	6,673	2,296	8,573
1983	92	3	4	321	801	2,670

N/C = No count taken.

Table 18. Length Data of Slana River Whitefish*.

Date	No.	Fork Length Length Range (mm and inches)	Average
10/22/64	28	292 - 348 mm 11.5" - 13.7"	320 mm 12.6"
10/19/69	55	235 - 446 mm 9.25" - 17.5"	353 mm 14"
10/12/72	50	320 - 430 mm 12.5" - 17"	368 mm 14.5"
10/16/74	12	242 - 413 mm 9.5 - 16.1_"	380 mm 16.25"
10/21/75	101	283 - 423 mm 11" - 16.5_"	346 mm 13.5"
10/13/76	102	250 - 430 mm 10_" - 17"	347 mm 13.5"
10/14/77	25	330 - 470 mm 13" - 18.5"	370 mm 14.5"
10/10/78	13	331 - 381 mm 12" - 15"	359 mm 14"
10/19/79	41	270 - 395 mm 10.5" - 15.5"	349 mm 13.75"
10/13/80 10/25/80	144	280 - 490 mm 11" - 19"	368 mm 14.5"
10/02/81 10/16/81 (5 sample nights)	262	340 - 480 mm 13 3/8" - 18 3/4"	370 mm 14.5"
10/08/82 10/18/82	130	285 - 425 mm 11" - 16.6"	366 mm 14.55"
10/15/83	112	292 - 463.6 mm 11.5" - 18.25"	368 mm 14.5"

* These measurements were taken from fish harvested by sport fishermen using spears. The dates listed are not necessarily those when the fish were most abundant.

LITERATURE CITED

Jones, D.E. 1983 Steelhead investigations in Southeast Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1982-1983, Project AFS-42, 24(AFS-42-10-A): 17 pp.

Mills, M.J. 1979. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1978-1979, Project F-9-11, 20(SW-I-A): 122 pp.

_____. 1980. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration. Annual Performance Report, 1979-1980, Project F-9-12, 21(SW-I-A): 65 pp.

_____. 1981a. Alaska statewide sport fish harvest studies, 1979 data. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22(SW-I-A): 77 pp.

_____. 1981b. Alaska statewide sport fish harvest studies, 1980 data. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22(SW-I-A): 107 pp.

_____. 1982. Alaska statewide sport fish harvest studies, 1981 data. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project F-9-14, 23(SW-I-A): 115 pp.

_____. 1983. Alaska statewide sport fish harvest studies, 1982 data. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24(SW-I-A): 118 pp.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada, 191: 382.

Wallis, J. and T. Balland. 1983. Anchor River steelhead study. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project AFS-48, 24(AFS-48-3): 44 pp.

Williams, F.T. 1971. Inventory and cataloging of sport fish and sport fish waters of the Copper River, Prince William Sound, and the upper Susitna River drainages. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1970-1971, Project F-9-3, 12(G-I-F): 117-136.

_____ and W.D. Potterville. 1980. Inventory and cataloging of sport fish and sport fish waters of the Copper River, Prince William Sound, and upper Susitna River drainages. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12, 21(G-I-F): 51pp.

_____ and W.D. Potterville. 1983. Inventory and cataloging of sport fish waters of the Copper River, Prince William Sound, and the upper Susitna River drainages. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24(G-I-F): 54 pp.

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